THE HOMEOWNER'S

OFF-OIL HEATING CONVERSION DECISION

The Costs and Benefits

1983 EDITION

Ministry of Energy
Ontario

Honourable Philip Andrewes
Minister

Energy Ontario

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ONTARIO MINISTRY OF ENERGY

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July 1983

NOTE

The examples given in this publication are for Metropolitan Toronto and may not be valid in other parts of Ontario.

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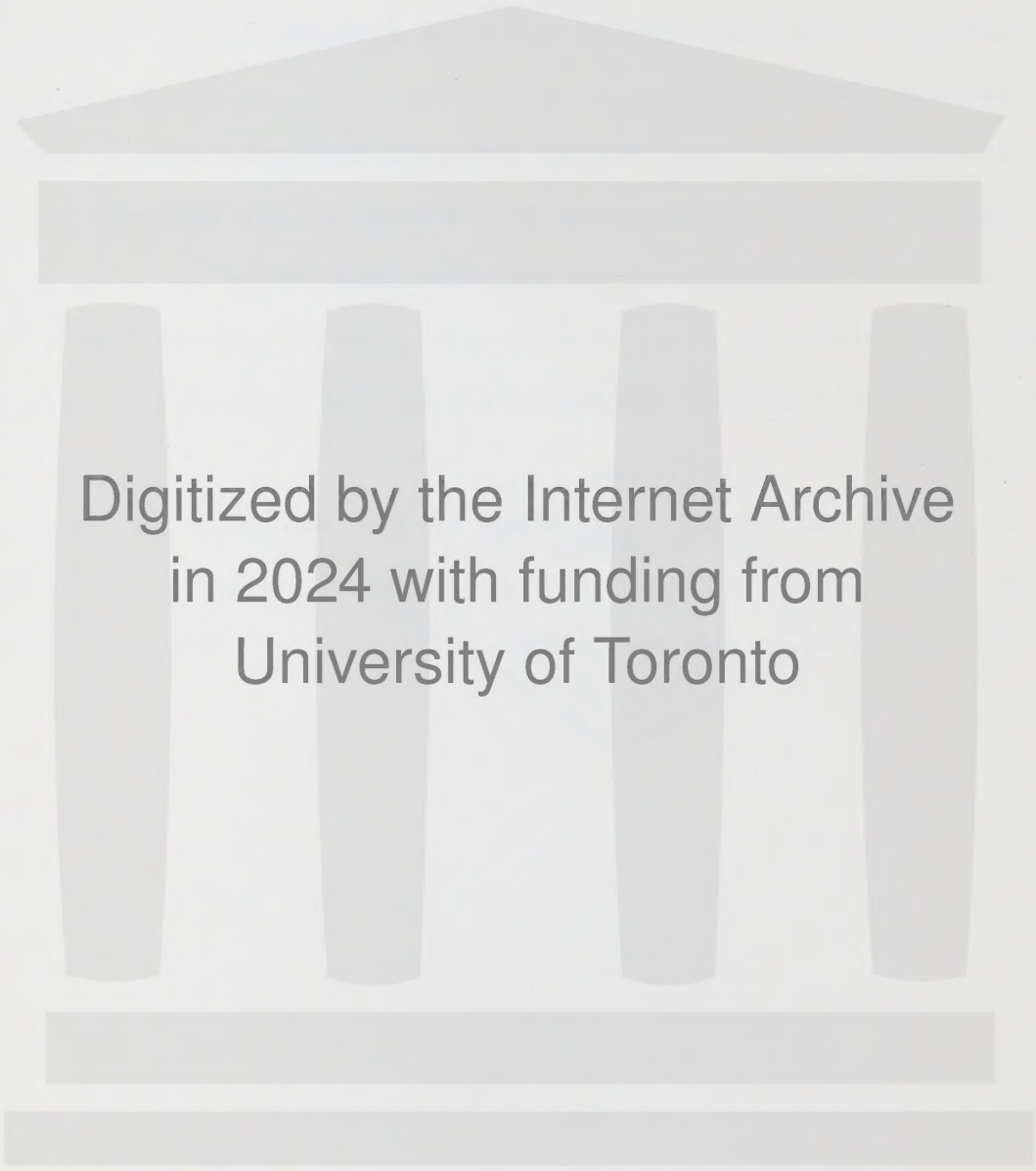

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THE HOMEOWNER'S OFF-OIL HEATING CONVERSION DECISION

This report describes the financial benefits that can result from improving, converting or replacing an oil furnace. Lower oil consumption offers substantial savings to many homeowners, reduces our dependence on imported oil, and conserves a diminishing resource.

Both the Ontario and the federal government encourage homeowners to go off-oil -- to heat with electricity, natural gas, wood, propane or other fuels to help reduce Canada's demand for oil. Converting to alternative heating fuels will help Canada achieve its goal of crude oil self-sufficiency by 1990.

CONSERVATION FIRST

Conservation is often the best - and lowest cost - energy investment for homeowners. Before modifying or replacing an oil furnace, homeowners should consider at least the following conservation measures:

1. Air sealing by caulking
    - the basement sill plate
    - wall penetrations for water and electrical services
    - ceiling fixtures and other attic penetrations
    - window and door frames
    - baseboards
2. Air sealing by weatherstripping doors, windows, electrical outlets and attic hatches
3. Insulating the attic
4. Adding storm windows and doors (including inexpensive single-season storm windows); upgrading windows to double or triple glazing
5. Insulating basement walls
6. Insulating exterior walls

Carrying out conservation measures first means that the capacity of any new heating unit can be reduced, thus saving more money. Any new heating system must be correctly sized to ensure proper performance and optimum efficiency. Homeowners must be careful under all circumstances to ensure that oil and gas furnaces have adequate fresh air for combustion purposes.

More detailed information on cost-effective conservation measures is available from the Ministry of Energy at (416) 965-3246 (Toronto local) or Zenith 80420; the federal government's Enersave Heatline at (613) 995-1801 (Ottawa local) or 1-800-267-9563; from The Pollution Probe Foundation's Ecology House at (416) 967-0577; or from local utilities and heating contractors.

BACKGROUND

Canada imports about 5-10% of its crude oil needs, at high prices. Moreover, the price of Canadian crude oil is rising toward world levels. Other forms and sources of energy such as electricity and natural gas are also rising in price, but are likely to be less expensive than oil during and beyond the 1980s.

While the outlook for future oil supplies is uncertain, Canada currently has adequate supplies of natural gas and electricity.

Many Ontario homeowners can save money and contribute to our energy security by converting wholly or partially from heating with oil to heating with an alternative fuel.

CAVEAT

Estimates of the financial attractiveness of home heating systems depend on many assumptions. The data shown in this booklet refer to houses in the Toronto area, and may not be valid in other parts of Ontario. Readers should remember that the financial attractiveness of different heating systems will vary as circumstances, location and costs change and that factors such as the sizes of different heating units, noise levels, convenience and appearance should be considered before a final "Off-Oil" decision is made.

FINANCIAL ASSISTANCE PROGRAMS

The federal government has introduced the Canada Oil Substitution Program (COSP), the Canadian Home Insulation Program (CHIP) and the Residential Rehabilitation Assistance Program (RRAP). These programs provide financial assistance to homeowners who wish to convert from oil, or to upgrade the energy efficiency of their homes by adding insulation, weatherstripping, and caulking.

Ontario Hydro has developed a Residential Energy Advisory Program (REAP) which offers energy advice and loans (below the current bank rate for personal loans) to consumers for insulating, upgrading electrical wiring, and installing electrical heating equipment. In conjunction with some municipalities and in rural areas, they also offer a $100-$200 contribution toward the cost of installing an add-on electrical heating system when an outside thermostat controls the operation of the dual-energy device.

Gas utilities provide information and advice for conversion to natural gas. They also offer assistance in furnace selection and financing.

These programs and services are explained in greater detail at the end of this report.

IMPROVING, CONVERTING OR REPLACING AN OIL FURNACE - AVAILABLE OPTIONS

The homeowner considering a partial or complete furnace conversion has four broad options:

- Increasing the efficiency of the existing oil furnace,
- Supplementing oil heat with heat from another source,
- Converting the existing furnace to burn a different fuel,
- Replacing the existing furnace with a new heating system.

The common alternative fuels are natural gas, electricity and, in rural areas, wood. In regions where natural gas service is not available, a homeowner might consider heating with propane, particularly if natural gas service is planned for the region. However, homeowners considering propane-burning equipment should bear in mind that propane is as expensive a heating fuel as oil. Active solar energy heating systems are also an expensive space heating alternative for most homes in Ontario.

Most oil-heated homes have either a forced warm air furnace, or hot water radiators. Some homes heat with oil-fired space heaters.

There are a variety of heating systems which can replace or supplement an oil-fired system. Brief descriptions of many of these are provided on the following pages. Homeowners considering a furnace conversion should bear in mind that new heating systems typically are quite compact, and their installation may therefore result in space savings. The expected lifespans of the add-on or conversion systems listed pertain to the new system only; in practice, the lifespan of such a system is frequently limited by the lifespan of the older oil furnace to which it is attached. It should be noted, however, that the lifespan of an existing oil furnace may be extended with the addition of an add-on electrical heating unit (baseboards, plenum heater or heat pump), as a result of reduced operation time.

ELECTRIC AND DUAL ENERGY HEATING SYSTEMS

- Electric Baseboards: Electric baseboard heaters can supplement or replace any oil-fired heating system. Complete replacement will probably require 200 ampere electric service; supplementary heat can be obtained without a change in the electric service. Baseboard heaters offer three particular advantages - they are silent, they have virtually no maintenance costs and they allow installation of an independent thermostat in each room. Independent thermostats permit the homeowner to heat fully those rooms which are used regularly while maintaining other rooms at lower temperatures. The cost of installing electric baseboards varies considerably, and depends on the structure of the house and its electric service capacity. Expected lifespan: 30+ years. Approximate installed cost including electric service upgrade (before COSP grant): $2000-3500.

  Note: "Plug-in" baseboards are recommended for occasional limited use only. Overuse of such units can be a safety hazard.

- Electric Furnace: An oil furnace can be entirely replaced by an electric furnace. Ordinarily this will require 200 ampere electric service. Expected lifespan: 20+ years. Approximate installed cost including electric service upgrade (before COSP grant): $2100-2500.

- Electric Plenum Heater: Installed in the warm air plenum of an oil furnace, the electric plenum heater produces heat using electric resistance elements similar to those of an electric furnace. It utilizes the existing furnace blower and ductwork to distribute the heat. There are several sizes available, ranging from five to eighteen kilowatts. Such units will typically replace 50-100 per cent of oil-fired heat with electric resistance heat. During much of the year, the plenum heater will heat the entire house; during the coldest periods the oil furnace takes over. Plenum heaters equipped with load controllers do not usually require an electric service upgrade, and are less expensive to install than an all-electric heating system. They can be installed only in some furnaces; an energy advisor from a local hydro, or a qualified contractor, can determine whether a particular furnace can have a plenum heater installed. This is a recently developed technology, but an electric plenum heater should have a lifespan like that of an electric furnace. Expected lifespan: 20+ years or oil furnace lifespan if shorter. Approximate installed cost (before COSP grant): $1000-1700.

- Electric Boiler: An oil-fired hot water boiler can be replaced by an electric boiler. 200 ampere electric service is normally required. Expected lifespan: 15 years. Approximate installed cost including electric service upgrade (before COSP grant): $2600-3000.

- Add-On Heat Pump: This is an electrically operated heating and cooling system that extracts heat from outside the house (usually the outdoor air) and discharges it into the furnace ducts. The heat pump provides more heat energy than the electrical energy needed to operate it. It will heat the home on its own, or at colder temperatures will alternate with the oil furnace in providing heat. At approximately -15°C, the efficiency of the heat pump (which decreases as the outdoor temperature drops) approaches that of electric resistance heating systems. In addition to space heating, a heat pump provides summer cooling by extracting heat from indoor air and expelling it outdoors.

  Prior to the installation of a heat pump, the ductwork, furnace fan and fan motor should be checked by a qualified contractor to ensure that they can handle the high volume of air circulation required. As the heat pump provides central air conditioning, its installation may increase the assessed value of the house for property tax purposes. Expected lifespan: 10+ years or lifespan of oil furnace if shorter. Approximate installed cost (before COSP grant): $3100-4400.

- All-Electric Heat Pump: This system replaces an oil furnace and provides full winter heating and summer cooling. It operates similarly to the add-on heat pump, but uses electric resistance elements instead of the oil furnace to provide supplementary heat during very cold weather. An all-electric heat pump requires 200 ampere electric service. The ductwork should be checked by a qualified contractor to ensure that it can handle the high volume of air circulation required. The addition of a heat pump may increase the assessed value of the house for property tax purposes because of the central air conditioning feature. Expected lifespan: 10+ years. Approximate installed cost including electric service upgrade (before COSP grant): $5100-6000.

  Note: Heat pumps (such as those described above) which extract heat from outdoor air and discharge the heat into the furnace ducts are known as "air-to-air" heat pumps. All references to heat pumps in this booklet pertain to air-to-air pumps only.

For further information on these and other electrical heating systems such as plug-in baseboards and space heaters, contact your municipal electric utility; Ontario Hydro; the Ontario Electrical League; the Electrical Contractors Association of Ontario; or the Heating, Refrigerating and Air Conditioning Institute of Canada. Each of these can provide the names of qualified contractors or distributors in your area.

NATURAL GAS SYSTEMS

- Natural Gas Conversion Burner: The oil burner in furnaces or boilers can frequently be replaced with a gas conversion burner. Gas service is installed and the oil tank is removed. If the chimney does not have a properly installed clay or metal liner, it is necessary to install a metal chimney liner to protect the chimney against liquid condensate from the flue gas. Expected lifespan: 21 years or oil furnace lifespan if shorter. Approximate installed cost including chimney liner (before COSP grant): $800-1200; can be rented from some utilities.

- Conventional Gas Furnace/Boiler: Some oil furnaces and oil boilers cannot be economically converted with a replacement gas burner; replacement with a gas furnace or gas boiler is an alternative. A new conventional gas furnace or boiler is installed, gas service is provided and the oil tank is removed. A metal chimney liner is required if the chimney is not properly lined. Conventional gas furnaces are also available with spark ignition devices which eliminate the fuel wastage of a pilot light, and a flue damper which reduces heat loss through the chimney. Expected lifespan: furnace: 18 years; boiler: 24-35 years. Approximate installed cost including chimney liner (before COSP grant): furnace: $1600-1800; boiler: $2400-2600.

- Induced Draft Gas Furnace/Boiler: This system is similar to a conventional gas furnace or boiler with spark ignition, but includes a fan to remove flue gas actively, rather than allowing flue gas to exit passively via the chimney. It uses 20-25 per cent less gas than a conventional gas furnace. Flue gases can be ejected horizontally through the wall, eliminating the need for a chimney. This is a recently developed technology, but induced draft systems are expected to have a lifespan like that of a conventional gas furnace. Approximate installed cost (before COSP grant): furnace: $1900-2200; boiler: $3000-$3600.

- Condensing Gas Furnace/Boiler: This high efficiency system uses 30 per cent to 40 per cent less fuel to provide the same amount of heat as a conventional gas furnace or boiler. It does not require a chimney but is vented either vertically or horizontally through the wall using small diameter (1.5-2.0 inch) plastic pipe. It produces liquid condensate that is disposed of via the sewer. Condensing systems can be modified simply and inexpensively to operate using propane. As this is a recently developed technology, the lifespan of condensing furnaces and boilers is uncertain, but is expected to be similar to that of conventional units since many manufacturers offer 20-year warranties on the major system components. Approximate installed cost (before COSP grant): furnace: $2200-2500; boiler: $3300-4700.

For further information about these and other natural gas heating systems, contact a qualified natural gas heating contractor; the Heating, Refrigerating and Air Conditioning Institute of Canada; or your local gas utility (for most of the province this means Union Gas Limited, The Consumers' Gas Company, or Northern and Central Gas Corporation Limited).

WOOD AND OTHER DUAL ENERGY SYSTEMS

- Wood stove: If correctly sized and located, a wood stove can reduce oil consumption by more than half for many homes. Efficient air-tight wood stoves, if they are certified to the appropriate Canadian Standards Association (CSA) or Underwriters' Laboratories of Canada (ULC) standard, are eligible for a federal COSP grant. It is recommended that only such certified units be used. Particular chimney types, correct installation and regular maintenance (including regular chimney cleaning) are required for the safe use of wood systems. Expected lifespan: 15-20 years. Approximate installed cost including chimney (before COSP grant): $1000-1500.

- Wood furnace/boiler: Log burning wood furnaces and boilers can replace an oil furnace. However, a house heated solely by such systems cannot be left unattended in cold weather without risking frozen water lines. Supplementary heating should be used if the home is likely to be left unattended. Expected lifespan: 15-20 years. Approximate installed cost (before COSP grant): $2500-4000.

  Wood/electric, wood/oil, and wood chip or pellet furnaces are also available. These reduce or eliminate the risk of frozen water lines, as they can operate while unattended for several days or more. Wood chip and wood pellet furnaces have only recently been developed, and are available in very limited quantities. At present, they are substantially more expensive than other wood heating systems. Wood/electric or wood/oil furnaces can be installed for approximately $1700-2500 (before COSP grant). Boilers are slightly more expensive.

  Note: Insurance companies sometimes impose a surcharge on fire insurance premiums if a wood heating system is installed. Homeowners considering using wood heating should check first with their insurance company.

For further information on wood heating systems and on heating systems using propane or solar energy, contact the Ontario Ministry of Energy at 965-3246 (in Toronto) or Zenith 80420. The federal government's Conservation and Renewable Energy Office at 2242 Lakeshore Boulevard West in Metropolitan Toronto can also supply information on these systems. In Toronto call 252-5866, outside Toronto call 1-800-268-2207.

MODIFICATIONS TO EXISTING OIL FURNACES AND BOILERS

Homeowners can reduce oil consumption by improving an existing oil furnace. Common improvements include:

- New Oil Burner: In some cases the oil burner can be replaced by a more efficient unit, usually incorporating a retention head burner with a smaller nozzle and a solenoid shut-off valve. Expected lifespan: 21 years or oil furnace life if shorter. Approximate installed cost: $400-450.

- New Oil Furnace: Furnaces which are not in good condition can be replaced by a new, more efficient oil furnace. This may require installation of a chimney liner if the chimney is not already properly lined. Expected lifespan: 18 years. Approximate installed cost: $1500-1700.

  Note: Modifying an oil system or replacing it with a new oil system does not qualify the homeowner for a COSP grant.

For further information on these or other improved oil burning systems, contact a qualified oil heating contractor.

More information on heating systems and system alterations is available in the booklet make the most of your heating system, available from the Ministry of Energy at 965-3246 (local) or Zenith 80420; or from the Ministry of Municipal Affairs and Housing at 965-4073.

THE FINANCIAL BENEFITS OF AN OFF-OIL CONVERSION

Analysis of the financial benefits of a partial or complete oil-substitution decision begins with the questions:

A) What do alternative systems cost?
B) What are the savings that result?

The costs of an alternative system may include any of the following:

- capital and installation costs (less federal grant if applicable)
- removal of old equipment
- adding a chimney liner (some gas installations)
- gas connection charge (occasional)
- electric service upgrade (some electric installations)
- improving ductwork
- tax re-assessment (electric heat pump options with central cooling)
- maintenance costs
- fuel consumption costs
- insurance premium increases (wood options)

The savings from an option may include:

- reduced fuel demand with installation of a more efficient system
- reduced fuel costs of electricity, gas, or wood compared to oil
- reduced maintenance costs compared to an oil furnace/boiler

In this analysis, all costs were included except the cost of gas connection charges, ductwork modifications, insurance premium increases, and tax reassessments. All three forms of savings were included. Costs were based on Toronto-area prices. As capital and installation costs are considerable for many heating systems, it is important that all costs be taken into account when different heating systems are compared.

The alternative heating systems were compared using two measures:

1) Discounted 15-year cost
2) Discounted payback period.

DISCOUNTED 15-YEAR COST

The discounted 15-year cost is the total estimated cost of heating a house for 15 years, in present value dollars. It includes capital and installation costs, operating costs and maintenance costs for each system. Although 15 years is representative of the lifespan of many heating systems, systems such as electric baseboards or a gas boiler may last 25 years or more.

Present value calculations use a discount rate to translate future (inflated) cash flows into amounts comparable to an investment made today ("present value dollars"). Thus the discounted 15-year cost appears to be considerably less than the nominal or "as spent" cost of heating a home, and discounted savings translate into significantly larger amounts on an "as spent" basis.

For this analysis, an 11.0 per cent discount rate was chosen to reflect expected inflation of 6.5-8.0 per cent annually over the 15 year period, plus an additional 3-4 per cent as a typical premium that investors can earn in excess of inflation. The selection of a lower discount rate, eg. 10 per cent, would favour high capital cost, high efficiency systems such as heat pumps and condensing furnaces. Conversely, the use of a higher discount rate would favour lower cost systems such as conversion burners and plenum heaters.

DISCOUNTED PAYBACK PERIOD

The discounted payback period is the time required for the cumulative operating and maintenance cost savings of an alternative system (discounted as above) to exceed the cumulative payments made to that point (also discounted). For example, if the loan payments on an alternative system costing $1,000 were $410 annually for three years (assuming no out-of-pocket payment was made), and if the system produced operating savings of $380, $420 and $450, the payback period would be between two and three years. If, however, the first year savings were $420, the discounted payback period would be about a year. This measure generally favours low-cost systems, and is biased against higher cost systems which may offer greater long-term savings. Homeowners who expect to move in a few years and do not expect the resale value of the house to increase if an energy-efficient heating system is installed may wish to use this measure to assess the financial attractiveness of different systems. However, the discounted 15-year cost is in most respects a better means of comparing the alternatives.

Since the heating needs of the house significantly affect the financial attractiveness of the various systems, both 15 year costs and payback periods were calculated for several oil consumption levels. A typical oil-heated Toronto house consumes 2500 to 3500 litres of oil per year at about 33¢ per litre.

Other factors affecting the financial attractiveness of the alternative systems include:

- the fuel-burning efficiency of different heating systems;
- the estimated future cost of fuels (oil, gas, electricity, wood);
- the timing of the savings (other things being equal, immediate savings are more desirable than future savings);
- the assumed lifespan of the systems.

WHAT DOES THE ANALYSIS SHOW?

Analyses are provided for homes using an oil-fired forced warm air system and for homes using a hot water system.

NOTES: The results presented in the following pages are for illustrative purposes only. They do not constitute an endorsement of any particular heating fuel or system. Homeowners should bear in mind that the results depend on assumptions concerning capital costs, fuel costs, maintenance costs, lifespans, system efficiencies, discount rates and other factors. All of these can vary substantially from region to region and even house to house. So, therefore, can the associated 15-year costs and discounted payback periods. All figures shown here are representative of the Toronto area and may not be valid in other parts of Ontario. Readers wishing to perform an analysis using their own figures should consult Appendix C.

The fuel price forecast used in this analysis was produced, using the best available information, in July 1983. If significant changes occur in Canadian government policy relating to oil and gas pricing, if unexpected changes to international energy prices occur, or if changes in the structure of oil, gas or electricity rates take place (such as a disproportionate increase in the minimum monthly bill) the fuel price forecast may become obsolete, and the results presented here may no longer be valid.

New heating systems are under constant development. Some which may be available in the foreseeable future include induced draft oil furnaces and condensing oil furnaces.

Case One: Oil Fired Forced Warm Air System

A list of the alternative heating systems examined appears below. The list includes most systems currently available to urban homeowners. A brief assessment of rural heating alternatives is provided at the end of this section. Note that certain options (marked with an asterisk) should be considered only if the existing oil furnace is in good condition.

CASE ONE: OPTIONS EXAMINED

Conversion Gas Burner plus Chimney Liner*
Conventional Gas Furnace plus Chimney Liner
Conventional Gas Furnace plus Spark Ignition (SI), Flue Damper, and Chimney Liner
Induced Draft Gas Furnace
Condensing Gas Furnace
Electric Baseboards
9 kilowatt (kW) Plenum Heater*
15 kilowatt (kW) Plenum Heater*
Electric Furnace
Add-On Heat Pump*
All-Electric Heat Pump
New Oil Burner*
New Higher Efficiency Oil Furnace
Do Nothing

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* SHOULD BE USED ONLY IF EXISTING OIL FURNACE IS IN GOOD CONDITION

Table 1 shows estimated 15-year discounted costs for all systems at various oil consumption levels. Several points are evident:

1. Compared to an existing oil furnace, most alternative heating systems will save money at most oil consumption levels.

2. Systems with lower capital costs but higher operating costs, such as a conversion gas burner, are attractive primarily at low consumption levels.

3. Modifications to the oil furnace save money, but are not generally as cost effective as conversion to a gas system or an electrical system.

When interpreting Table 1, readers should remember that:

- The capital costs of some options may decrease in future years. The condensing gas furnace is a recent example. The cost of all-electric heating systems may be lower than assumed here if a load-controlling device is substituted for a service upgrade.

- Heating with wood is costly for most urban homeowners. Rural heating is dealt with separately (page 18).

- Different systems have different lifespans. Some, such as electric baseboards and the conventional gas boiler, can be expected to last considerably more than 20 years.

- The capital costs used for these calculations are shown in Table 1, Appendix A. Readers wishing to compare systems using different capital costs should adjust the estimated costs shown in Table 1, Page 14, upwards or downwards by the amount of the capital cost difference. See Appendix C for a description of how to calculate discounted 15-year costs.

- The efficiencies of heating systems produced by different manufacturers can vary substantially, even when similar technologies are compared. For example, the steady state efficiency of "condensing" gas furnaces ranges from about 86 per cent to about 98 per cent. Seasonal efficiencies vary correspondingly. The steady state and seasonal efficiencies assumed for this analysis are shown in Appendix A, Tables 4, 5 and 6. Other things being equal, systems with efficiencies higher than assumed here would have lower 15-year costs and shorter payback periods than those appearing in these pages. Lower efficiency systems would have higher costs and longer payback periods.

TABLE 1

Discounted 15-Year Costs* ($) - Forced Warm Air Heating Systems

Option	Oil Consumption Level (litres/year)** 2000	3000	4000	5000	6000
Conversion Gas Burner plus Chimney Liner	6800	9300	11800	14300	16800
Conventional Gas Furnace plus Chimney Liner	7300	9800	12300	14800	17300
Conventional Gas Furnace plus SI, Flue Damper and Chimney Liner	7200	9400	11600	13700	15900
Induced Draft Gas Furnace	6600	8500	10400	12200	14100
Condensing Gas Furnace	6200	7900	9500	11200	12800
Electric Baseboards	7400	10400	13500	16500	19600
9 kW Plenum Heater	6800	9800	12900	16100	19400
15 kW Plenum Heater	6800	9700	12600	15500	18800
Electric Furnace	7500	10400	13200	16000	18800
Add-on Heat Pump***	8400	10500	13000	15400	17600
All-Electric Heat Pump***	10000	11700	13900	15700	17400
New Oil Burner	7500	10600	13800	16900	20100
New Higher Efficiency Oil Furnace	8300	11200	14200	17100	20000
Do Nothing	8100	11800	15400	19100	22800

* Costs shown include capital, operating and maintenance costs.

** 1 litre = 0.22 Imperial gallons.

*** Heat pumps also provide air conditioning. For homeowners who intend to install air conditioning, the heat pump is more attractive than would otherwise be the case. The discounted 15-year cost of installing and maintaining central air conditioning is about $1,500-$2,400; to compare other systems to heat pumps for heating and air conditioning, add this amount to the cost figures in Table 2. For example, the 15-year cost of heating plus the air conditioning unit is about $11,300-$12,200 for a conventional gas furnace at the 3000 litre consumption level, while the comparable figure for the all-electric heat pump is $11,700.

TABLE 2

Discounted Payback Periods (Years) -
Forced Warm Air Heating Systems

Option	Oil Consumption Level (litres/year)* 2000	3000	4000	5000	6000
Conversion Gas Burner plus Chimney Liner	5	1	1-	1-	1-
Conventional Gas Furnace plus Chimney Liner	8	5	4	1	1-
Conventional Gas Furnace plus SI, Flue Damper and Chimney Liner	9	6	4	3	1-
Induced Draft Gas Furnace	7	4	3	1-	1-
Condensing Gas Furnace	7	4	3	1-	1-
Electric Baseboards	10+	9	8	8	7
9 kW Plenum Heater	5	4	3	1-	1-
15 kW Plenum Heater	6	4	3	1-	1-
Electric Furnace	10+	8	7	5	5
Add-on Heat Pump	10+	9+	7	6	5
All-Electric Heat Pump	10+	10+	10+	9	7
New Oil Burner	6	4	1-	1-	1-
New Oil Furnace	10+	10+	8	6	5

* 1 litre = 0.22 Imperial gallons

Table 2 shows the estimated discounted payback period for each system at various consumption levels. Note that the payback period decreases as consumption increases.

It is also important to note that systems with short payback periods are not necessarily cheapest in the long term. For example, a gas conversion burner pays for itself in less than a year at the 4000 litre consumption level, but is considerably more expensive than a condensing gas furnace over a 15 year span. Clearly the condensing gas furnace is better in the long term - not only does it have lower total costs, which is good for the homeowner, but it consumes less fuel, which is good for everyone. A similar comparison can be made of a plenum heater and a heat pump.

Case Two: Oil Fired Hot Water System

The chart below shows the options examined as alternatives to an oil-fired hot water system. The list includes most alternatives currently available to urban homeowners.

CASE TWO: OPTIONS EXAMINED

Electric Boiler
Electric Baseboards
Gas Conversion Burner plus Chimney Liner*
Conventional Gas Boiler plus Chimney Liner
Induced Draft Gas Boiler
Condensing Gas Boiler
New Oil Burner*
Do Nothing

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* SHOULD ONLY BE USED IF EXISTING OIL SYSTEM IS IN GOOD CONDITION.

Estimated 15-year discounted costs at various consumption levels are displayed in Table 3. Note that:

1. Compared to an existing oil boiler, most alternative heating systems can save money.

2. As the oil consumption level increases, high-efficiency alternatives become more attractive.

Table 4 shows estimated discounted payback periods for hot water system alternatives. Again, the payback period of each alternative decreases as the oil consumption level increases. The system with the shortest payback period is usually not cheapest in the long run.

TABLE 3

Discounted 15-Year Costs* ($) - Hot Water Heating Systems

Option	Oil Consumption Level (litres/year)** 2000	3000	4000	5000	6000
Electric Boiler	7900	10800	13600	16400	19200
Electric Baseboards	7400	10400	13500	16500	19600
Gas Conversion Burner plus Chimney Liner	6900	9400	11900	14400	16900
Conventional Gas Boiler plus Chimney Liner	8100	10600	13100	15600	18100
Induced Draft Gas Boiler	7700	9600	11500	13300	15200
Condensing Gas Boiler	8300	10100	11800	13500	15200
New Oil Burner	7500	10700	13800	16900	20100
Do Nothing	8100	11800	15400	19100	22800

TABLE 4

Discounted Payback Periods (Years) - Hot Water Heating Systems

Option	Oil Consumption Level (litres/year)** 2000	3000	4000	5000	6000
Electric Boiler	10+	10	8	7	6
Electric Baseboards	10+	9	8	8	7
Gas Conversion Burner plus Chimney Liner	5	3	1-	1-	1-
Conventional Gas Boiler plus Chimney Liner	10+	9	6	5	4
Induced Draft Gas Boiler	10+	8	6	4	4
Condensing Gas Boiler	10+	10	7	5	4
New Oil Burner	6	4	2	1-	1-

* Costs shown include capital, operating and maintenance costs

** 1 litre = 0.22 Imperial gallons

RURAL HOMEOWNERS

Rural homeowners often face a different set of alternatives for an off-oil decision. Frequently, natural gas is not available; on the other hand, wood is usually available at prices that are considerably lower than those offered to urban homeowners. In such cases, wood is financially attractive as a partial or complete alternative to oil. The financial advantages of wood increase noticeably if homeowners cut wood themselves or buy it in four foot lengths rather than purchasing it in the split and dried form.

Electrical alternatives to oil heating are slightly more costly in rural areas than in urban areas; nevertheless, most electrical alternatives offer savings comparable to those which appear in Tables 1 and 3.

SUMMARY OF ANALYSIS

The benefits of converting from oil to electricity, gas or other fuels can be substantial, both financially and as a contribution to attaining our national energy goals. The actual choice of alternative or supplementary heating system will depend on the homeowner's location; the state of the current oil heating system; the initial cost, size and operating convenience of alternative systems; the availability of alternative fuels; the homeowner's own preferences regarding fuels and systems; whether or not air conditioning is desirable; and a variety of other considerations.

Any homeowner upgrading a system should first ensure that the house is well insulated, ventilated, weatherstripped and caulked and should take advantage of all eligible financial assistance programs offered by the federal government, Ontario Hydro, and the natural gas utilities. The programs are outlined in more detail in the following pages.

FINANCIAL ASSISTANCE PROGRAMS:

ASSISTANCE FROM ELECTRICAL UTILITIES: -

RESIDENTIAL ENERGY ADVISORY PROGRAM (REAP)

Under this program, Ontario Hydro and many municipal electrical utilities will advise homeowners on ways to make the home more energy-efficient and will lend up to $2,000, at interest rates close to the Ontario Hydro borrowing rate (currently about three per cent below the bank rate for personal loans), to:

- generally improve a home's energy efficiency;
- improve home insulation;
- upgrade electrical wiring;
- convert heating systems wholly or partially to electrical heating.

In addition, they will:

- assess the home's insulation, ventilation, weather sealing and electrical wiring needs;
- help homeowners take full advantage of federal assistance plans such as CHIP (Canadian Home Insulation Program) and COSP (Canada Oil Substitution Program);
- provide a list of qualified contractors for energy conservation or electrical heating projects;
- conduct a follow-up inspection, if required, when the work is completed.

Homeowners must first use any applicable COSP or CHIP grants and pay $200 of the remaining cost before becoming eligible for a REAP loan, which is repayable over a period of up to five years.

REAP is one of the important initiatives of the Ontario government's BILD (Board of Industrial Leadership and Development) strategy, which stresses the importance of both conservation and the wise use of electrical energy to Ontario's economic future.

REAP exists throughout Hydro's rural service area. Ontario Hydro has also a program to encourage homeowners to install a dual energy heating system. Currently, it includes a contribution of up to $200 to the cost of installing an electric dual energy system controlled by an outdoor thermostat. Municipal electric utilities have the authority to undertake similar programs in their service areas, and many have done so.

For further information, call Ontario Hydro at 592-3815 in Toronto, or your municipal electric utility or public utilities commission.

ASSISTANCE FROM GAS UTILITIES

Natural gas utilities in Ontario also provide information and assistance to homeowners for off-oil conversions and energy conservation. These utilities will:

- help homeowners take full advantage of federal assistance plans such as CHIP (Canadian Home Insulation Program) and COSP (Canada Oil Substitution Program);
- locate qualified contractors for natural gas heating projects;
- finance furnace conversions at market rates with repayment on the monthly gas bill;
- offer conservation improvement packages and financing for these packages (varies among utilities);
- conduct a follow-up inspection when the work is completed.

CANADA OIL SUBSTITUTION PROGRAM (COSP)

The federal government offers taxable grants to homeowners, businesses and certain non-profit organizations reducing their oil heating needs by at least 50 per cent.

In Ontario, eligible alternatives include electricity, natural gas, propane, wood, wind, solar, coal and peat.

The taxable grant covers 50 per cent of eligible conversion costs up to a maximum grant of $800 for single-family residences or other buildings and up to $5,500 for multiple unit buildings. The program is effective for conversions made on or after October 28, 1980, until December, 1990.

Application forms are available from the gas utilities for gas conversions, public utility commissions for electric conversions, or the Conservation and Renewable Energy Office of Energy, Mines and Resources Canada (416-252-5866 or 1-800-268-2207) for all other conversions.

CANADIAN HOME INSULATION PROGRAM (CHIP)

This federal program provides taxable grants to homeowners who insulate or weatherize homes built before 1971. The grant covers 60 per cent of eligible costs up to a maximum grant of $500.

For more information regarding CHIP call 789-0581 in Metropolitan Toronto or 1-800-268-1818 toll-free in other areas of the province.

RESIDENTIAL REHABILITATION ASSISTANCE PROGRAM (RRAP)

This program is sponsored by the Canada Mortgage and Housing Corporation (CMHC). RRAP offers loans of up to $10,000 for specified home repairs, including heating system and electrical system repairs. The loans are available to households whose annual income does not exceed $23,000. Up to 50 per cent of the loan may be forgiveable. Further information can be obtained from the CMHC.

THE HOMEOWNER'S OFF-OIL HEATING CONVERSION DECISION

APPENDIX A: DATA USED IN THE ANALYSIS

Note: Costs shown are examples only. Actual costs may differ substantially from these.

All costs, efficiencies, lifespans and fuel consumption levels are within the range of values provided by industry personnel and published sources.

All figures relate to the Toronto area.

TABLE 1: CAPITAL COSTS ($)*

	BASIC COST	COSP** GRANT	NET COST
OIL SYSTEMS			
Existing Furnace	-	-	-
Existing Boiler	-	-	-
New Burner (Furnace)	420	0	420
New Burner (Boiler)	450	0	450
New Higher Efficiency Oil Furnace	1600	0	1600
GAS SYSTEMS			
Conversion Burner plus Chimney Liner	1020	354	666
Conventional Furnace plus Chimney Liner	1720	556	1164
Conventional Furnace plus Spark Ignition, Flue Damper and Chimney liner	2170	556	1614
Induced Draft Furnace	2150	556	1594
Condensing Gas Furnace	2300	556	1744
Conversion Burner (Boiler) plus Chimney Liner	1170	407	763
Conventional Boiler plus Chimney Liner	2520	556	1964
Induced Draft Boiler	3200	556	2644
Condensing Gas Boiler	4100	556	3544
ELECTRICAL AND DUAL ENERGY SYSTEMS			
Plenum Heater			
- 9 kW	1040	361	679
- 15 kW (100 Ampere service or greater)	1200	417	783
Add-on Heat Pump			
- 2.0 ton	3100	556	2544
- 2.5 ton	3400	556	2844
- 3.0 ton	3700	556	3144
All-Electric Heat Pump***			
- 2.0 ton	5500	556	4944
- 2.5 ton	5900	556	5344
- 3.0 ton	5900	556	5344
Electric Furnace***	2300	556	1744
Baseboard Heaters***			
- 9 kW	2280	556	1724
- 11 kW	2520	556	1964
- 13 kW	2760	556	2204
- 15 kW	3000	556	2444
- 17 kW	3240	556	2684
Electric Boiler***	2700	556	2144

* Including purchase, installation, removal of oil tank, etc.
** After tax. Marginal tax rate assumed to be 30.5 per cent.
*** Costs shown include the cost of electrical upgrade.

TABLE 2: TORONTO-AREA FUEL PRICE ASSUMPTIONS

	Average Price 1983	Average Annual Escalation Rate (%)			
		1983-87	1987-92	1992-97	1983-97
Fuel Oil	31.90¢/L	7.56	9.50	8.23	8.49
Natural Gas	22.69¢/M^3	7.51	9.74	8.11	8.52
Electricity	3.83¢/kWh	9.06	7.55	7.06	7.80

TABLE 3: HEAT CONTENT OF ALTERNATIVE FUELS (MEGAJOULES)

Oil (Litre)	38.675
Natural Gas (Cubic Meter)	37.470
Electricity (Kilowatt Hour)	3.600

TABLE 4: TORONTO-AREA GAS PRICE ADJUSTMENT FACTORS*

Option	Oil Consumption Level (litres/year)** 2000	3000	4000	5000	6000
Gas Conversion Burner	1.078	1.028	1.002	0.986	0.975
Conventional Gas Furnace/ Boiler	1.078	1.028	1.002	0.986	0.975
Conventional Furnace plus Spark Ignition, Flue Damper	1.100	1.043	1.014	0.996	0.983
Induced Draft Furnace/Boiler	1.125	1.062	1.028	1.007	0.993
Condensing Boiler	1.141	1.073	1.039	1.015	0.999
Condensing Furnace	1.151	1.081	1.043	1.020	1.004

* Used to adjust the natural gas prices seen in TABLE 2 to account for differences in the effective price of gas at different consumption levels. Based on the residential rate structure of the Consumers' Gas Company Ltd. as of July, 1983.

** 1 litre = 0.22 Imperial gallons

TABLE 5: MAINTENANCE COSTS ($)*

	ANNUAL COST
OIL SYSTEMS	
All Systems	72
GAS SYSTEMS	
Conventional Furnace; Conversion Burner/Boiler	25
Conventional Furnace plus Spark Ignition, Flue Damper; Induced Draft Furnace/Boiler; Condensing Furnace/Boiler	35
ELECTRICAL AND DUAL ENERGY SYSTEMS	
Plenum Heater**	36
Add-on Heat Pump**	105 +
Baseboards	0
Electric Furnace	15
All-Electric Heat Pump**	89 +
Electric Boiler	15

* Inflated at 7.0 per cent annually.
** Includes cost of furnace maintenance.

\+ See Appendix B for an explanation of heat pump maintenance costs and lifespan.

TABLE 6: OTHER COSTS ($)*

Chimney Liner **	320
Electrical Upgrade	1200
Flue Damper***	300

* Included in capital costs (Table 1) where appropriate.

** Approved single wall metal chimney liner.

*** Can be added to oil furnaces only. Available as an integral part of some gas systems.

TABLE 7: ASSUMED STEADY-STATE (SS) AND SEASONAL (SE) EFFICIENCIES (%)

OIL SYSTEMS	SS	SE
Existing Furnace/Boiler	73	60
New Burner (Furnace/Boiler)	80	70
New Higher Efficiency Furnace/Boiler	83	75
GAS SYSTEMS		
Conversion Burner (Furnace/Boiler)	75	60
Conventional Furnace/Boiler	76	60
Conventional Furnace plus Spark Ignition and Flue Damper	76	69
Induced Draft Furnace/Boiler	83	80
Condensing Furnace	95	92
Condensing Boiler	90	87
ELECTRICAL SYSTEMS		
Plenum Heater	100	100
Electric Furnace	100	100
Baseboard Heater	100	100
Electric Boiler	100	100

TABLE 8: TORONTO-AREA OIL DISPLACEMENT AND SYSTEM SEASONAL EFFICIENCIES - PLENUM HEATERS

OIL DISPLACEMENT (%)*

Option	Oil Consumption Level (litres/year)** 2000	3000	4000	5000	6000
9 kW Plenum Heater	87-100 (93)	86-100 (87)	81-100 (82)	72-99 (78)	67-99 (72)
15 kW Plenum Heater	90-100 (100)	90-100 (100)	88-100 (98)	85-100 (95)	80-100 (90)

SYSTEM SEASONAL EFFICIENCY (%)*

Option	Oil Consumption Level (litres/year)** 2000	3000	4000	5000	6000
9 kW Plenum Heater	100	100	100	100	100
Oil Furnace	60	60	60	60	60
Total System	96	92	89	87	84
15 kW Plenum Heater	100	100	100	100	100
Oil Furnace	60	60	60	60	60
Total System	100	99	97	96	91

* Toronto - area figures only. Not necessarily applicable to other areas.

** 1 litre = 0.22 Imperial gallons

TABLE 9: TORONTO-AREA OIL DISPLACEMENT AND SEASONAL PERFORMANCE FACTORS - HEAT PUMPS

	Oil Consumption Level (litres/year)*				
	2000	3000	4000	5000	6000
Heat pump size (tons)	2.0	2.0	2.5	3.0	3.0
Add-on Heat Pump:					
Oil Displacement (%)	70	70	70	70	70
Coefficient of Performance (%)**	190	190	190	190	190
Total System Efficiency (%)	115	115	115	115	115
All-Electric Heat Pump:					
Seasonal Performance (%)***	160	160	160	160	160

* 1 litre = 0.22 Imperial gallons

** The coefficient of performance is the amount of useful heat energy produced by the heat pump, divided by the amount of energy consumed by the heat pump. This ratio is used to measure the heat pump's performance at temperatures above -15°C (approximately). Estimates for this figure in the Toronto area range from 150 to 220 or more.

*** The seasonal performance factor is the amount of useful heat energy produced by the heat pump and the resistance electric heat backup system, divided by the amount of energy consumed by the two systems. This factor pertains to the entire heating season, regardless of temperature.

OTHER ASSUMPTIONS

- Gas and oil options: Capital costs covered by 3 year loan at 13.50%
- Electrical options: first $200 covered by 3 year loan at 13.50%, next $2000 or less covered by 3 year REAP loan at 11.25%, remainder covered by 3 year loan at 13.50%
- Nominal Discount Rate: 11.0% for all options
- All options make maximum use of available grants and subsidies
- Rate structures for all fuels remain constant

THE HOMEOWNER'S OFF-OIL HEATING CONVERSION DECISION

APPENDIX B: HEAT PUMP LIFESPAN AND MAINTENANCE COSTS

Heat Pump Life Span and Maintenance Costs

The lifespan of the heat pump is a matter of debate, with estimates ranging from 10 to 15 years. For this analysis, 15 years has been assumed. Although individual components of the heat pump may not last for the entire period, it appears that a heat pump system, if maintained properly, should do so.

The complexity of the heat pump relative to most other heating systems dictates that maintenance costs may well increase over time, even after the effects of inflation are taken into account. The schedule of maintenance costs used for the present analysis was:

	Cost (Before Inflation)	
Year	Add-On Heat Pump	All-Electric Heat Pump
1	$ 105	$ 89
2	105	89
3	105	89
4	105	89
5	105	89
6	165	151
7	165	151
8	165	151
9	165	151
10	165	151
11	180	163
12	180	163
13	180	163
14	180	163
15	180	163

Costs shown include the cost of maintaining an oil or electric furnace for the add-on and all-electric heat pump respectively.

THE HOMEOWNER'S OFF-OIL HEATING CONVERSION DECISION

APPENDIX C: DOING YOUR OWN ANALYSIS

CALCULATING 15-YEAR DISCOUNTED COSTS

The discounted 15-year cost is the total cost of owning, operating and maintaining a heating system for 15 years. It is measured in present value (today's) dollars, as described on page 10. It can easily be calculated using figures from Tables 1-5 of this appendix. A sample calculation for a condensing gas furnace installed in a house currently consuming 4000 litres of oil annually follows:

CAPITAL COST

Installed Cost (from contractor)	$2,300
Less COSP grant	-800
Plus tax on COSP grant	240
Net Capital Cost*	$1,740
FUEL COST (Table 2)	$7,300
MAINTENANCE COST (Table 4)	$ 370
TOTAL DISCOUNTED 15-YEAR COST	$9,410

Note that the fuel costs are based on 1983 rates for the Consumers' Gas Company Limited. To adjust this figure for different 1983 gas rates, simply multiply by the ratio of the appropriate end block (lowest) rate to Consumers' end block rate (currently about 20.7¢/cubic metre). For example, an equivalent figure for a homeowner paying 22¢/m^3 would be:

$7300 x 22¢ ÷ 20.7¢ = $7760

A similar adjustment can be made to the maintenance cost figure.

* Net Capital Cost can depend on assumptions regarding the way in which the purchase is financed. In other parts of this document, it is assumed that a loan is used; in this example, the system is paid for "out of pocket".

TABLE 1: 15-YEAR DISCOUNTED FUEL COST* - OIL SYSTEMS

Current Oil Consumption (litres/year):	2000	3000	4000	5000	6000
Forced Warm Air Systems:					
Existing Oil Furnace	7300	11000	14700	18300	22000
New Oil Burner	6300	9400	12600	15700	18900
New Higher Efficiency Oil Furnace	5900	8800	11700	14700	17600
Hot Water Systems:					
Existing Oil Boiler	7300	11000	14700	18300	22000
New Oil Burner	6300	9400	12600	15700	18900

* Assumes a 1983 oil price of 31.9¢/litre and escalation rates shown in TABLE 2, Appendix A.

TABLE 2: 15-YEAR DISCOUNTED FUEL COST* - GAS SYSTEMS

Current Oil Consumption (litres/year):	2000	3000	4000	5000	6000
Forced Warm Air Systems:					
Gas Conversion Burner plus Chimney Liner	5800	8300	10800	13300	15800
Conventional Gas Furnace plus Chimney Liner	5800	8300	10800	13300	15800
Conventional Gas Furnace plus SI, Flue Damper and Chimney Liner	5200	7400	9500	11700	13900
Induced Draft Gas Furnace	4600	6500	8300	10200	12100
Condensing Gas Furnace	4100	5700	7300	9000	10600
Hot Water Systems:					
Gas Conversion Burner plus Chimney Liner	5800	8300	10800	13300	15800
Conventional Gas Boiler plus Chimney Liner	5800	8300	10800	13300	15800
Induced Draft Gas Furnace	4600	6500	8300	10200	12100
Condensing Gas Boiler	4300	6000	7700	9500	11200

* Assumes July 1983 Consumers' Gas rates and escalation rates shown in TABLE 2, Appendix A.

TABLE 3: 15-YEAR DISCOUNTED FUEL COST* - ALL-ELECTRIC AND DUAL ENERGY HEATING SYSTEMS

Current Oil Consumption (litres/year):	2000	3000	4000	5000	6000
All Electric Systems:					
Electric Baseboards	5600	8400	11200	14100	16900
Electric Furnace	5600	8400	11200	14100	16900
All-electric Heat Pump	3500	5300	7000	8800	10500
Electric Boiler	5600	8400	11200	14100	16900
Dual Energy Systems:					
9 kW Plenum Heater	5700	8700	11900	15000	18300
15 kW Plenum Heater	5600	8500	11400	14400	17600
Add-on Heat pump	4300	6400	8500	10700	12800

* Assumes a 1983 oil price of 31.9¢/litre, a 1983 electricity price of 3.83¢/kilowatt-hour and escalation rates shown in TABLE 2, Appendix A.

TABLE 4: 15-YEAR DISCOUNTED MAINTENANCE COSTS - ALL SYSTEMS BUT HEAT PUMPS

Cost in 1983	15-Year Discounted Cost
$ 10	106
20	212
30	318
40	424
50	530
60	636
70	742
80	848
90	954
100	1,060

TABLE 5: 15-YEAR DISCOUNTED MAINTENANCE COSTS - HEAT PUMP SYSTEMS*

Cost in 1983	15-Year Discounted Cost
$ 50	770
60	926
70	1,080
80	1,234
90	1,388
100	1,542
110	1,696
120	1,852

* Heat pump only. For add-on heat pumps, the cost of maintaining the oil furnace should be added to provide a total estimated maintenance cost.

CALCULATING SIMPLE PAYBACK PERIODS

The discounted payback period used in other parts of this document, while simple in concept, is complicated and time-consuming in application. A substitute which provides a similar comparison of alternative heating systems and is straightforward to apply is the Simple Payback Period. It is calculated as:

$$P = CC/S$$

where P = simple payback period in years
CC = capital cost of the system being considered
S = operating (fuel and maintenance) savings in the first year.

The capital cost and expected maintenance cost of the system can be determined through discussions with one or more contractors. The operating savings can be calculated by subtracting the expected first year fuel and maintenance costs of the conversion system from those of the existing system. The expected 1983 fuel price savings for various alternative heating systems are shown in Tables 6-8 of this appendix.

A sample calculation follows for a homeowner who is currently consuming 4000 litres of oil per year, and is considering installing a 9kw plenum heater:

Capital cost (from contractor):	$1,040
Less COSP grant	-520
Plus tax on COSP grant	159
Net Capital Cost:	$ 679
1983 Maintenance Cost Savings	$ 36
1983 Fuel Cost Savings (from Table 3)	236
Total expected 1983 operating savings	$ 272

Simple payback period (P) = 679/272 = 2.5 years

Note that this calculation depends on assumptions concerning the relative operating efficiencies and capacities of different heating systems, and on assumptions regarding the prices of oil, gas and electricity. The prices assumed in the creation of Tables 1-3 are shown at the bottom of each Table; higher oil prices or lower gas or electricity prices than those assumed in the Tables would result in great annual savings and shorter payback periods than are suggested by the numbers in this document. All other assumptions used in Tables 1-3 are shown in Appendixes A and B.

TABLE 6: 1983 FUEL COST SAVINGS ($)*:
IMPROVED OIL-FIRED HEATING SYSTEMS

Oil Consumption Level (litres/year):	2000	3000	4000	5000	6000
Warm Air Systems:					
New Oil Burner	91	137	182	228	273
New Higher Efficiency Oil Furnace	128	191	255	319	382
Hot Water Systems:					
New Oil Burner	91	137	182	228	273

* Based on an oil price of 31.9¢/litre. Higher oil prices would result in greater savings and shorter payback periods.

TABLE 7: 1983 FUEL COST SAVINGS ($)*:
NATURAL GAS HEATING SYSTEMS

Oil Consumption Level (litres/year):	2000	3000	4000	5000	6000
Forced Warm Air Systems:					
Conversion Gas Burner plus Chimney Liner	133	234	337	440	543
Conventional Gas Furnace plus Chimney Liner	133	234	337	440	543
Conventional Gas Furnace plus SI, Flue Damper and Chimney Liner	190	319	449	581	712
Induced Draft Gas Furnace	243	397	553	710	867
Condensing Gas Furnace	286	461	638	816	994
Hot Water Systems:					
Conversion Gas Burner plus Chimney Liner	133	234	337	440	543
Conventional Gas Boiler plus Chimney Liner	133	234	337	440	543
Induced Draft Gas Boiler	243	397	553	708	867
Condensing Gas Boiler	269	437	604	775	947

* Based on an oil price of 31.9¢/litre and Consumers' Gas rates as of July 1983. Higher oil prices or lower gas prices would result in larger savings and shorter payback periods.

TABLE 8: 1983 FUEL COST SAVINGS ($)*:
ALL-ELECTRIC AND DUAL ENERGY HEATING SYSTEMS

Oil Consumption Level (litres/year):	2000	3000	4000	5000	6000
All Electric Systems:					
Electric Baseboards	144	217	288	360	433
Electric Furnace	144	217	288	360	433
All-Electric Heat Pump	330	494	659	823	988
Electric Boiler	144	217	288	360	433
Dual Energy Systems:					
9 kW Plenum Heater	134	188	236	281	311
15 kW Plenum Heater	198	212	277	335	368
Add-on Heat Pump	265	397	529	662	794

* Based on an oil price of 31.9¢/litre and an electricity price of 3.83¢/kilowatt-hour. Higher oil prices or lower electricity prices would result in larger savings and shorter payback periods.

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